

UH Managed lands – Project Proposal

for projects anticipated to be classified as having “Minimal Impact”

Applicant Name: University of Hawai‘i, School of Ocean and Earth Science and Technology

Project Name: Precipitation Collector on the UH88-inch Telescope on Maunakea

Brief Description of the Project:

Five-year installation of one rain collector unit on the UH88 Telescope to collect precipitation for regular isotopic analysis.)

Identified Land Use (see HAR § 13-5-22 through 13-5-25)

(HAR) § 13-5-22; P-1 DATA Collection (B-1) *Basic data collection, research, education, and resource evaluation....*)

Identify existing CDUUP this proposal alters or affects, if any: HA-954 (1977)

Identify University of Hawai‘i exemption per HAR § 11-200-8(a), if any:

Exemption Class #5 basic data collection....which do not result in a serious or major disturbance to an environmental resource.

#1: Gathering of soil, air, water,

Tax Map Key(s): TMK: (3)4-4-015:009 -- Mauna Kea Science Reserve (por.)

Proposed Commencement Date: December 2017

Proposed Completion Date: December 2023

Estimated Project Cost: ~\$100 for onsite equipment

Total size / area of proposed use: 1.5 sq ft (area of collection bucket)

Project Purpose and Need

The sparse connectivity and subsurface water flow data in the Hualālai aquifer prevent accurate prediction of supply issues and responses to water challenges. Recent analysis of the Keauhou Aquifer (part of Hualālai Aquifer) and Hilo Aquifer systems indicate that significant inter-aquifer flow may exist. The naturally-occurring oxygen and hydrogen isotopic composition of water can be used as the primary tracer to investigate groundwater flow regimes.

The purpose of this ‘Ike Wai component is to construct a model of flow and connectivity that integrates isotope measurements, general groundwater chemistry, with land use and aquifer matrix geochemistry. Precipitation samples will be collected along transects on the major mountains, and where possible, co-located with existing precipitation measurement stations. These will be maintained for up to 5 years and samples collected from each quarterly. This will allow calculation of a volume-weighted isotopic composition of precipitation. The samples will be analyzed for O&H isotopes and major ions.

Existing Conditions at Project Site(s)

Geology, Climate, & Hazards

Maunakea is considered an active, post-shield phase volcano (USGS). Climate conditions at this altitude (12,500' and above) are often below freezing and when combined with precipitation or high humidity (often a very localized phenomena) ice can form on cinder surfaces resulting in natural cinder movement from geophysical processes and form rime ice on infrastructure. Temperature on site averages 40-degree Fahrenheit and winds at 30 - 40MPH, high elevation (13,400-ft elevation), with low oxygen levels. Average annual precipitation is less than 10".

Flora, Fauna, Ecology, Water Resources

No vegetation, flora, fauna, or water resources are in the proposed project area as it is currently being used as an astronomical observatory and for vehicle parking and occasional vehicle movement. The Office of Maunakea Management currently monitors the site for native and invasive species.

Cultural Resources

There are no archaeological sites in the vicinity of the roof of the UH 88" telescope where the rain collector will be located. The facility is within the boundaries of the Kukahau'ula Traditional Cultural Property (SIHP #21438). The physical placement of the rain collector would be on the building roof.

Recreation

The area surrounding the building is used during periods of sunrise and sunset for viewing and photographic opportunities.

Built Infrastructure

The existing building infrastructure is of concrete, metal siding and steel dome. The building is currently undergoing renovations, approved through SPA HA 17-25 and expected to be completed by late November 2017. The roof renovations will be completed prior to installation of the rain collector for the anticipated start of this project.

Landscaping & Visual Conditions

Existing landscape is volcanic cinder. This project does not anticipate any disturbance to the ground. Per the original DLNR (1977) CDUA staff recommendation, landscaping is confined to the grading required to prevent erosion and to minimize construction scars.

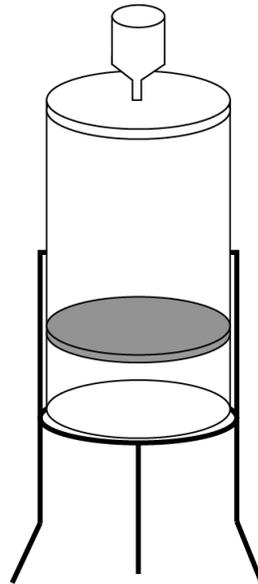
Description of the Project

Rainwater samples will be collected quarterly, or approximately three-month intervals, from a collection bucket on the roof of the UH88" observatory. Other sites, all previously permitted, are at lower elevations in the Hualālai and Hilo aquifers will be similarly sampled. Analysis will occur offsite to determine isotopic composition of oxygen and hydrogen ("O&H").

This project will provide basic precipitation isotope data in terms of rain/snowfall, fog-drip and other forms of precipitation to the summit of Maunakea.

The following are images of two types of rain collectors we will use in the project. We will determine which design works best for the single rain collector placed atop the UH-88 telescope based on trials at lower elevation sites.

Rain Collector



- 'Buchner' Funnel
- O-ring sealed lid
- HDPE Bucket
- Layer of mineral oil (>1 cm thick)
- Tripod Stand

Based on Scholl Oil-type collector; adapted from design by Friedman (1992)

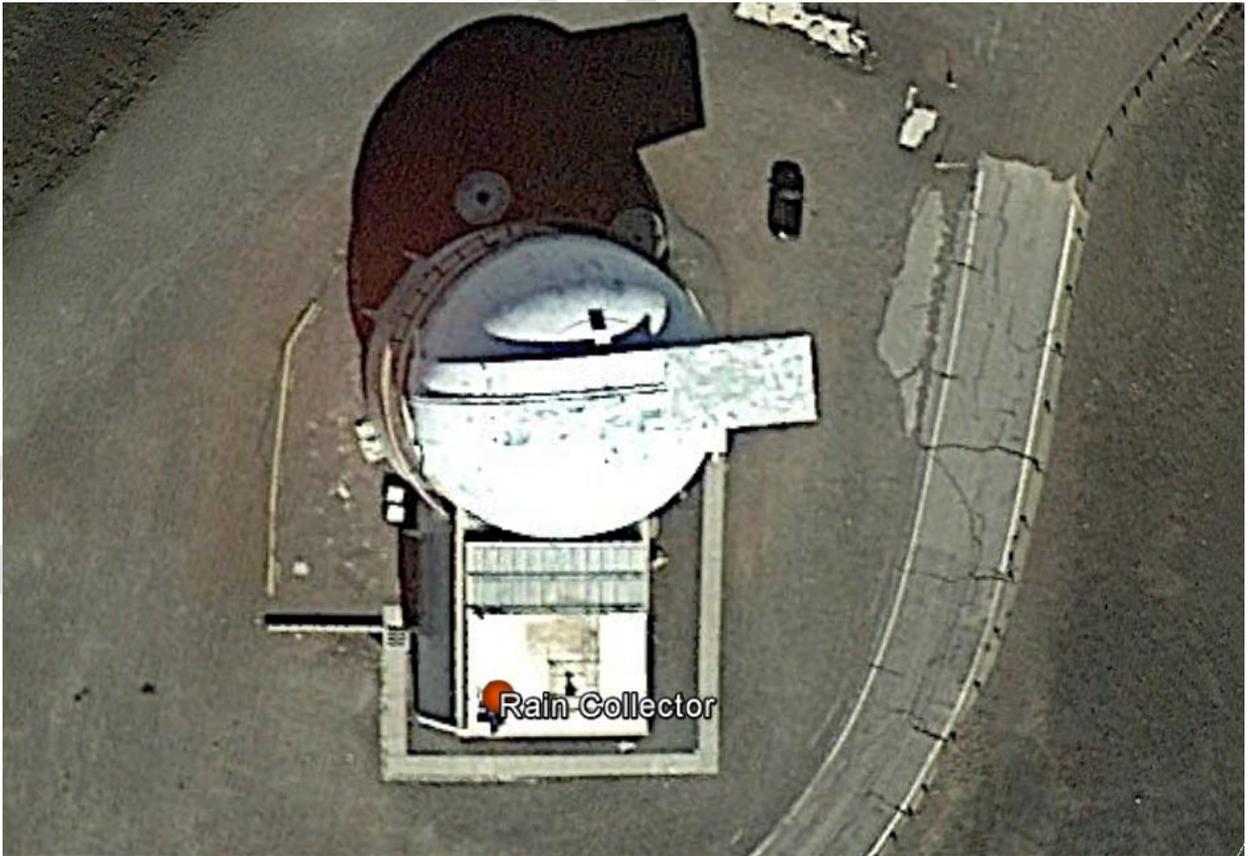
The figure on the left is a Nova Lynx “rain and snow gauge” that can be purchased online and is easy to assemble. It has holes in the stand legs so that it can be bolted to a flat surface. The figure on the right is project-designed and based on a USGS study conducted first in the Kilauea volcano area, and also on Haleakala, Maui (Scholl et al., 1996, Fackrell dissertation, 2016). In either style of rain collector, a layer of mineral oil will be placed inside the collector in order to prevent the collected precipitation from evaporating. We want to prevent evaporation because that will affect the O&H isotopic composition of the precipitation we are collecting.

Location

The rainwater collector will be anchored to the metal grate on the roof of the UH88” coude building. The collector will be clamped in place and no permanent roof modifications are needed.



Rendered Northeast view of the observatory



Approximate location rain collection device (observatory image from pre-renovations).

Who will do the work?

UH Manoa PhD Candidate Diamond Tachera, advisor Dr. Nicole Lautze, and researchers Francois Paquay and Honour Booth will place the collector, collect and analyze samples; with assistance from other partners, OMKM, and UH88 staff if needed.

Equipment & Transportation

The project will require a standard four-wheel-drive vehicle to transport equipment and personnel to install the rain collector. It will take no more than one day to complete the installation, followed by quarterly sampling entailing an hour or two onsite.

Protective Measures

Implemented by University Hawai'i, School of Ocean and Earth Science and Technology.

- Notify OMKM in writing at least 5 days prior to beginning field work on UH managed lands (Halepōhaku, Road Corridor, Maunakea Science Reserve, or Astronomy Precinct). No project notification will be accepted by OMKM until all permit requirements are submitted to and approved by OMKM (i.e. any required BMPs, Communication Plans, contract scope questions, etc. must be finalized and approved by OMKM more than 5 days in advance of project commencement).
- All project participants must attend a Maunakea orientation *prior to* participating in field work.
- Use of 4-wheel drive vehicles when traveling above Halepōhaku is required.
- Allow OMKM Rangers to visit and monitor activities.
- Comply with all actions and measures described in the proposal, including (community) benefits, CMP compliance list, and mitigation measures.
- Ensure that loose tools or equipment are not left unattended and are properly stored at the end of each day.
- In preparation for high wind conditions protocols must include measures to ensure debris and equipment are not blown from the job site. Projects occurring in the summit region must verify that temporary and permanent infrastructure can sustain 120mph winds.
- All improvements shall be designed and installed to withstand the severe weather conditions on the mountain.
- Removal and proper disposal of all waste material. All perishable items including food, food wrappers and containers, etc. shall be removed from the site at the end of each day and properly disposed.
- Employ invasive species prevention best practices, including inspections of materials by a DLNR-approved biologist, as identified in the *Maunakea Invasive Species Management Plan* prior to entering UH managed lands.
- Nēnē (*Branta sandvicensis*) may be present. If a nēnē appears within 100 feet (30.5 meters) of ongoing work, all activity shall be temporarily suspended until the animal leaves the area of its own accord. Feeding of nēnē is prohibited.
- The project approval/permit may not be transferred or assigned. A copy of the approval/permit must be present on-site and available for review at all times while working on University-managed lands.
- No use of mechanized equipment is allowed unless authorized by this permit.
- Identify and comply with other permit requirements, such as County of Hawaii building permits or Department of Land & Natural Resources (see both any applicable DLNR permit and [HAR §13-5-42 Standard conditions](#)).

- Placement of permanent: markers, monuments, mag nails, survey pins, etc. is not allowed without explicit prior approval from OMKM (and the State if required) for this purpose. ALL surveyors work must be shared with OMKM in digital format (i.e. CAD file as well as PDF) with coordinate info stored in and using a common, transferrable coordinate reference system such as “State Plane Coordinates (NAD83), Hawaii Zone 1”.
- Electronic and paper copies of all publications resulting from the work will be provided to OMKM.
- Annual and final reports must be submitted to OMKM. OMKM will provide guidance on content to be included in such reports.
- A brief, approximately 1-page, non-technical summary suitable for public outreach (school groups, community meetings, newsletter articles, etc.) must be provided to OMKM within 90 days of project completion or publication. Photos and illustrations are encouraged.
- Notify OMKM in writing when field activity associated with the project is completed.
- The project must be completed within the time frame specified in the proposal and (when applicable) DLNR approval. Projects not completed within this timeframe are not allowed to continue (or commence) without explicit, prior, written approval from OMKM.

Compliance with Lease, Sublease, or Comprehensive Management Plan (CMP)

Relevant CMP management actions include:

NR-15: Conduct baseline inventories of high-priority resources, as outlined in an inventory, monitoring, and research plan.

NR-17: Conduct research to fill knowledge gaps that cannot be addressed through inventory and monitoring. |

Other required or associated permits

| Not applicable |

Five Year Outlook

| This project was not originally included in the UH 88-inch telescope (2.2m) five-year outlook. |

Community Benefits

Benefits to other Maunakea entities and/or global astronomy community

| Installation of the unit on the UH-88 demonstrates support for the 'Ike Wai project |

Benefits to the Hawaii Island community

| Precipitation data will be publicly available and will be used to generate groundwater models for sustainable use planning as well as improving broader understanding of groundwater issues on Maunakea. |

Will data, publications, or other products be free and available to the public?

| Yes. |

DLNR Evaluation Criteria

After approval by the Maunakea Management Board, the Department of Land & Natural Resources or Board of Land & Natural Resources, will evaluate the merits and approve the project based on the following eight criteria (§13-5-30). See <http://dlnr.hawaii.gov/occl/files/2013/08/13-5-2013.pdf>

1. The purpose of the Conservation District is to conserve, protect, and preserve the important natural and cultural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare. (ref §13-5-1)
How is the proposed land use consistent with the purpose of the conservation district?

The Board of Land and Natural Resources has adopted the Comprehensive Management Plan and subplans (Cultural Resources Management Plan, Natural Resources Management Plan, Public Access Plan, and Decommissioning Plan) as the approved management documents for land use and activities in the UH Management Areas. The CMP and subplans provide management strategies designed to preserve and protect the resources located in the UH Management Areas, and the University is committed to their implementation using the resources that are available to it. UH (2.2m Telescope) is also committed to implementation of the CMP. The proposed use is identified as a recommended action in the CMP and relevant subplans.

How is the proposed use consistent with the objectives of the Resource subzone of the land on which the land use will occur? (§13-5-13 The objective of this subzone is to ensure, with proper management, the sustainable use of the natural resources of those areas. This subzone shall encompass: lands necessary for providing future parkland and lands presently used for national, state, county, or private parks. Land suitable for outdoor recreational uses such as hunting, fishing, hiking, camping, and picnicking. [And other lands not applicable to Maunakea.]

The objective of the Resource subzone "...is to develop, with proper management, areas to ensure sustained use of the natural resources of those areas." The use that is proposed in this application is within the Conservation District Resource subzone. Data collection is an identified use in the Resource subzone (see HAR §13-5-24(c)). This project will inform future uses both within the Conservation District as well as island-wide. No change in footprint, extent, or intensity of existing uses will occur as a result of this activity.

2. Describe how the proposed land use complies with the provisions and guidelines contained in chapter 205A, HRS, entitled "Coastal Zone Management".

This criteria does not apply to the proposed activity.

3. Describe how the proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region.

The project proposes to place a 13 liter (or similar) bucket on top of the UH-88 coude building, which will be removed at the conclusion of the project. No change is foreseen to any natural resource, or surrounding area.

4. Describe how the proposed land use, including buildings, structures and facilities, is compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels.

The project seeks to add, for up to a five year period, a bucket onto the observatory rooftop, an existing building. The project will not directly affect the scientific, natural resource, or historic properties in the summit region. The project will increase our scientific understanding of natural

resources. No long-term changes to the physical conditions and capabilities of the parcel will occur. The activity is wholly within and consistent with the terms and conditions of the 2009 Comprehensive Management Plan. |

5. Describe how the existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon.

|No changes to these aspects will occur as a direct result of this use. |

6. If applicable, describe how subdivision of land will not be utilized to increase the intensity of land uses in the Conservation District.

|The proposed use does not involve the subdivision of land. |

7. Describe how the proposed land use will not be materially detrimental to the public health, safety and welfare.

|As a land use, this project does not have any direct impact to the public health, safety and welfare. However data resulting from this project will inform sustainable groundwater use based on improving scientific understanding. |